# NCEA Level 2 · AS 91269: Systems of Equations

Name: _____ Date: _____

This standard is all about solving two or three equations at once and using them to answer real questions. Work through each section in order, always writing your method clearly and checking your answer back in the original equations.

**Revision summary**

- A system of equations is two or more equations that share the same unknowns; a solution makes every equation true at once.
- Substitution: rearrange one equation for a variable, then substitute into the other. Best when a variable already has coefficient 1.
- Elimination: add or subtract multiples of the equations to cancel one variable. Best when coefficients line up neatly.
- Two linear equations in two unknowns usually give one solution (lines cross once). Parallel lines = no solution; identical lines = infinitely many solutions.
- For 3 unknowns: eliminate one variable using two different pairs of equations, giving a 2×2 system; solve that, then back-substitute.
- Modelling steps: define your variables clearly (with units), write one equation per condition, solve, then interpret the answer in context.
- Always check: substitute your solution back into the ORIGINAL equations and confirm the answer makes sense (e.g. no negative prices).
- Watch the units and the question, sometimes you need a combination (like total cost) rather than just x and y.

## Key skills

1. Solve by substitution: $y = 2x + 1$ and $3x + y = 16$.

2. Solve by elimination: $2x + 3y = 12$ and $2x - y = 4$.

3. Solve: $4a + 5b = 23$ and $3a - 2b = 5$.

4. Check whether $x = 5$, $y = -2$ is the solution to $3x + 4y = 7$ and $x - 2y = 9$.

## Achieved

5. At the Avondale market, 3 kererū-print tote bags and 2 keyrings cost $37. 1 tote bag and 4 keyrings cost $29. Find the price of one tote bag and one keyring.

6. A rectangle has perimeter 46 cm. Its length is 5 cm more than its width. Find the length and width.

7. Tickets to the Te Atatū school gala are $8 for adults and $5 for children. On Saturday 240 tickets were sold for a total of $1560. How many of each were sold?

8. Solve the system: $x + y = 10$, $y + z = 14$, $x + z = 12$.

## Merit

9. A café in Kingsland sells three sizes of hot chocolate. A small plus a medium costs $10. A medium plus a large costs $13. A small plus a large costs $11. Find the price of each size and explain which size gives the best value per drink.

10. Two mobile plans: Plan A charges a $20 monthly fee plus $0.10 per text. Plan B charges a $35 monthly fee plus $0.05 per text. Write equations for the monthly cost of each and find the number of texts where both cost the same. Explain which plan is cheaper for someone sending 400 texts a month.

11. A number of $2 and $5 koha envelopes were collected at a fundraiser. There were 3 times as many $2 envelopes as $5 envelopes, and the total collected was $132. How many envelopes were there altogether?

## Excellence

12. For what value of k does the system $2x + 3y = 12$ and $4x + ky = 20$ have no solution? Justify your answer, and state what happens for all other values of k.

13. A three-digit number has digits that add to 15. The tens digit is twice the hundreds digit. If the hundreds and units digits are swapped, the number decreases by 297. Find the original number and justify that it is unique.

14. Three friends compare weekly savings. Aroha saves $a, Ben saves $b, and Cara saves $c per week. Together they save $90 a week. Aroha saves $10 more than Ben. Cara saves the same as Aroha and Ben combined. Find each amount, then generalise: if the total is $T (with the same two relationships), express each person's saving in terms of T.